

CLOACINIDAE (NEMATODA: STRONGYLOIDEA) INCLUDING A NEW SPECIES, *DORCOPSINEMA SIMILE*, FROM *DORCOPSULUS VANHEURNI* (MARSUPIALIA: MACROPODIDAE) FROM PAPUA NEW GUINEA

by L. R. SMALES*

Summary

SMALES, L. R. (1999) Cloacinidae (Nematoda: Strongyloidea) including a new species, *Dorcopsinema simile*, from *Dorcopsulus vanheurni* (Marsupialia: Macropodidae) from Papua New Guinea. *Trans. R. Soc. S. Aust.* 123(4), 137-142, 30 November, 1999.

Paralabiostrongylus bicollaris, *Dorcopsistrongylus labiacarinatus*, *Coronostrongylus coronatus* and *Macropostrongylus* sp. are recorded from the stomach of the lesser forest wallaby *Dorcopsulus vanheurni* from Doido in Papua New Guinea. *Dorcopsinema simile* sp. nov. is described from the same host and locality. *Dorcopsinema simile* differs from *D. dorcopsis*, the only other species of *Dorcopsinema* occurring in forest wallabies, in having the nerve ring anterior to the deirids rather than posterior, larger eggs (120 µm x 68.5 µm compared with 115 µm x 57.5 µm) a shorter vagina (300-470 µm compared with 680 µm) and lateral branchlets arising anterior to the bifurcation of the dorsal ray rather than posterior to it. The fourth stage larva is described. A revised key to the species of *Dorcopsinema* is given. An analysis of the helminths occurring in *Dorcopsulus*, *Dorcopsis* and *Dendrolagus* suggests that the forest wallabies have a more diverse community than the tree-kangaroos, including components which are exclusive to the island of New Guinea as well as components that are common to both the Australian continent and New Guinea.

KEY WORDS: *Dorcopsulus vanheurni*, *Dorcopsinema*, nematodes, Cloacinidae, marsupials, Australia, Papua New Guinea.

Introduction

The genus *Dorcopsinema* Mawson, 1977 comprises strongyloid nematodes of the family Cloacinidae (Stossich, 1899) occurring in the stomachs of tree kangaroos, *Dendrolagus* Mueller & Schlegel, 1839 and forest wallabies *Dorcopsis* Schlegel & Mueller, 1842 (see Baylis 1940; Mawson 1977; Smales 1982a, 1997). There are, however, few records of parasitic helminths from the related genus of forest wallabies *Dorcopsulus* Matschie, 1916 and none from *Dr. vanheurni* (Thomas, 1922) (see Spratt *et al.* 1991). Four specimens of the small forest wallaby *Dr. vanheurni* collected from the Chimbu Province of Papua New Guinea in 1984 by R. Speare were found to have a diverse community of stomach nematodes. A new species of *Dorcopsinema* is described in this paper. New host records for other species of the Cloacinidae found in the stomachs of the animals examined are given below and new species of the genus *Cloacina* von Linstow, 1898 are reported elsewhere.

Materials and Methods

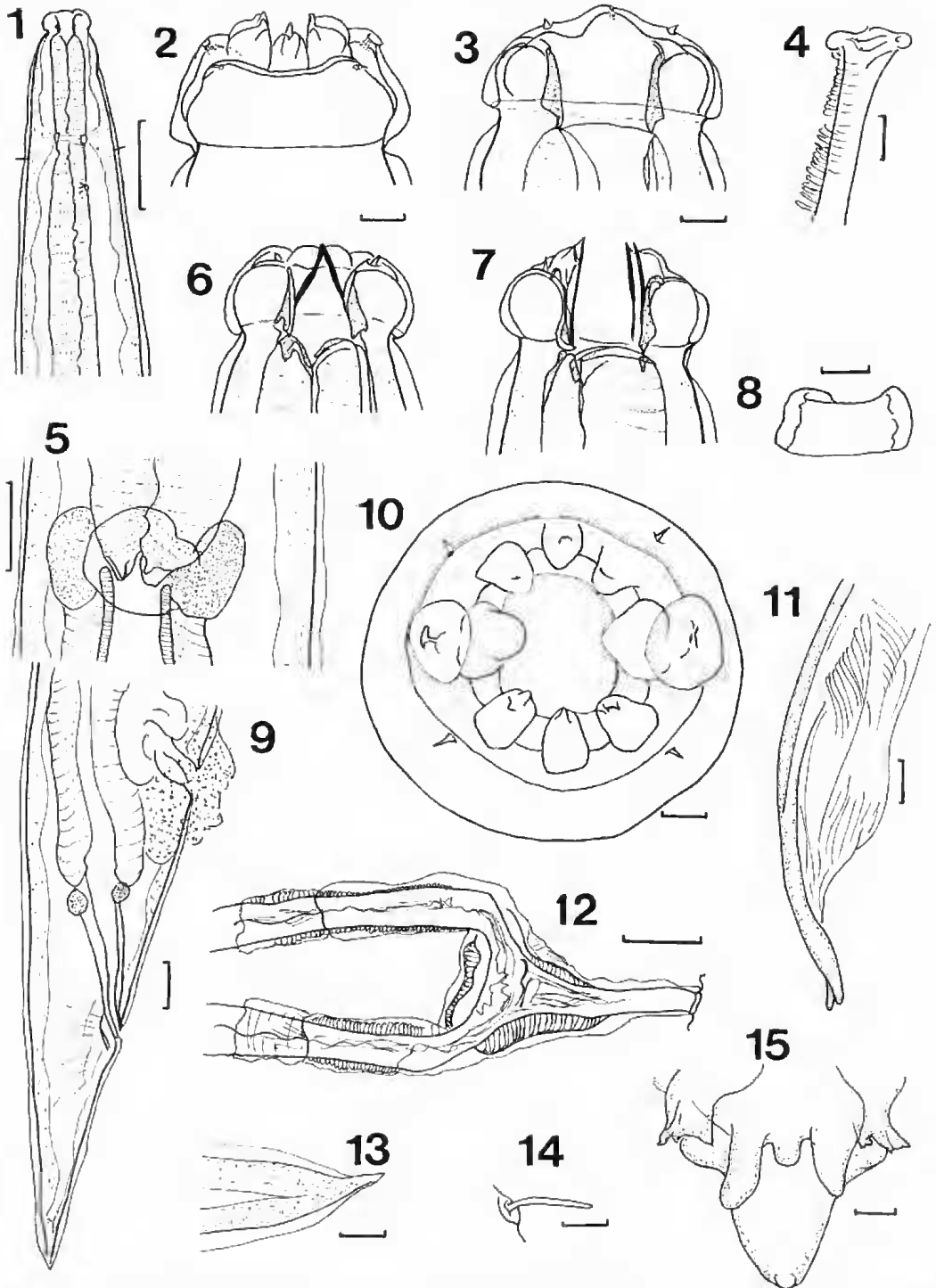
Stomach contents of lesser forest wallabies were fixed in 10% formalin in the field. Subsequently the

contents were washed in water to remove the formalin, nematodes were removed, washed again and stored in 70% ethanol. Worms were cleared in lactophenol prior to examination. Specimens from *Dorcopsulus* sp. deposited in The Natural History Museum, London (BMNH), were also examined. Measurements of 10 specimens, in micrometres unless otherwise stated, were made using an ocular micrometer and are presented as the range followed by the mean in parentheses. Figures were prepared with the aid of a drawing tube. Host names follow Flannery (1995). Nematode classification and terminology follow Beveridge (1987). All material has been deposited in the South Australian Museum, Adelaide (SAMA).

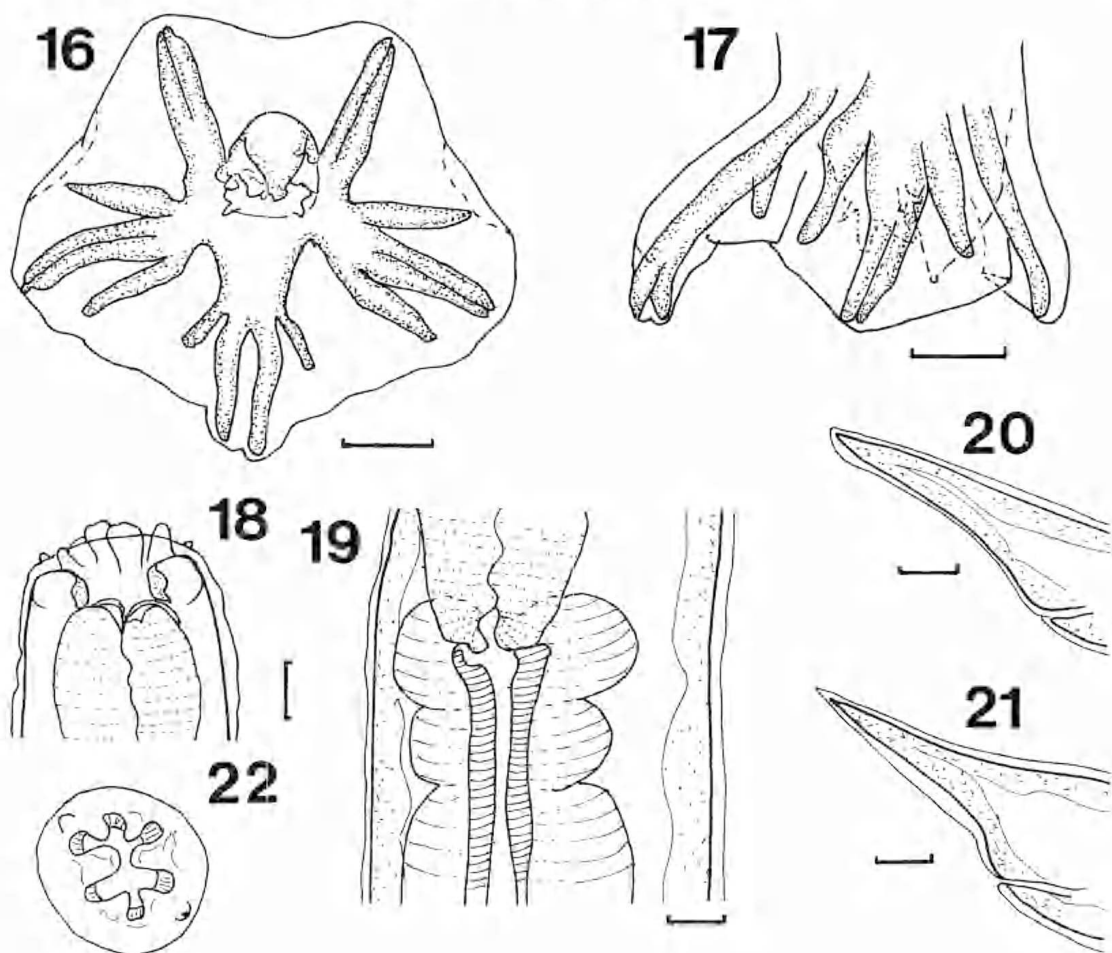
Results

Eight specimens of *Paralabiostrongylus bicollaris* Smales, 1982 (Cloacininae Stossich, 1899 : Labiostrongyliina Beveridge, 1983) from three host animals, 39 specimens of *Dorcopsistrongylus labiacarinatus* Smales, 1982 (Cloacininae : Pharyngostromyliina Popova, 1952) from four hosts, 37 specimens of *Coronostrongylus coronatus* Johnston & Mawson, 1939 (Cloacininae : Coronostromyliina Beveridge, 1986) from four hosts and one specimen of *Macropostrongylus* sp. Yorke & Maplestone, 1926 (Cloacininae: Macropostrongyliina Lichtenfels, 1980) from one host were found. Each of these is a new host record.

*School of Biological and Environmental Sciences, Central Queensland University Rockhampton Qld 4702.



Figs 1-15. *Dorcopsinema simile* sp. nov. 1. Anterior end (ventral view). 2. Cephalic end, lip-like elements extended (ventral view). 3. Cephalic end, lip-like elements not extended (lateral view). 4. Spicule, anterior end. 5. Oesophago-intestinal junction (lateral view). 6. Cephalic end, optical section (dorsal view). 7. Cephalic end, optical section (lateral view). 8. Gubernaculum (ventral view). 9. Posterior end, female (lateral view). 10. Cephalic end (*ten face* view). 11. Spicule tip (lateral view). 12. Ovejector (ventral view). 13. Female tail tip. 14. Deirid. 15. Genital cone (dorsal view). Scales bars = 500 μ m 1; 50 μ m 2 - 4, 6, 7, 13; 200 μ m 5, 9, 12; 25 μ m 8, 10, 11, 14, 15.



Figs 16–22. *Dorcopsinema simile* sp. nov. 16. Bursa (apical view). 17. Bursa (lateral view). 18. Fourth stage larva, cephalic end (lateral view). 19. Fourth stage larva, oesophago-intestinal junction showing developing diverticula (lateral view). 20. Fourth stage larva, developing female tail. 21. Fourth stage larva, developing male tail. 22. Fourth stage larva, cephalic end (*en face* view). Scale bars = 100 μ m 16, 17; 25 μ m 18, 19, 22; 50 μ m 20, 21.

Dorcopsinema simile sp. nov.
(FIGS 1–22)

Types: Holotype ♂, allotype ♀, paratypes 54 ♂♂, 72 ♀♀ from stomach of *Dorcopsulus vanheurni* (Thomas, 1922), Doido (6° 33' S, 144° 50' E), Chimbu Province, Papua New Guinea, coll. R. Speare; 17. v. 1984 SAMA/AHC 31326, AHC 31327, and AHC 31328 respectively.

Other material examined: From *Dorcopsulus vanheurni*: 2 ♂♂, 1 ♀, 4 larvae same data AHC31329. From *Dorcopsulus* sp.: 1 ♂, 2 ♀♀ Lae (6° 44' S, 147° 00' E), Morobe Province, Papua New Guinea, coll. N.T. Talbot, BMNH 1970. 499–508.

Description

Relatively large worms; body with fine transverse cuticular striations. Cephalic extremity with wide,

well-defined fleshy collar bearing two amphids, each on dome-like projection, and four cephalic papillae; peri-oral cuticle forming eight sclerotised lip-like processes arising within buccal capsule. Buccal capsule short, cylindrical, walls well sclerotised, within region of collar. Oesophagus long, clavate, about 20% body length. Oesophago-intestinal diverticula small; length of diverticula less than maximum width of oesophagus.

Male

Length 16–24 (20) mm, maximum width 665–1105 (760). Buccal capsule 60–85 (75) wide x 75–100 (88) deep. Oesophagus 3,500–4,760 (4,110) long. Nerve ring 580–735 (665), deirids 735–960 (855), secretory-excretory (S-E) pore 890–1155 (1020) from anterior end. Bursal lobes not separate;

dorsal lobe longest, ventral lobes shortest. Ventroventral and ventrolateral rays apposed, reaching margin of bursa; externolateral ray divergent, not reaching margin of bursa; mediolateral and posterolateral rays apposed, reaching margin of bursa; externodorsal ray arising close to lateral trunk, not reaching margin of bursa; dorsal trunk stout, bifurcating at about $\frac{1}{3}$ its length, rays reaching margins of bursa; each ray branching anterior to level of bifurcation. Lateral branchlets not reaching margin of bursa. Spicules 1685 – 2055 (1850) long, 9% body length; anterior extremities irregularly knobbed; distal tips slightly curved, finely striated broad alae not extending to spicule tips. Genital cone prominent; anterior lip larger conical, extending almost to limit of ventral lobes; posterior lip smaller with 3 pairs posteriorly directed appendages, short central projection. Gubernaculum rectangular.

Female

Length 28 – 32 (31) mm, maximum width 1020 – 1530 (1190). Buccal capsule 80 – 100 (97) wide x 92 – 101 (99) deep. Oesophagus 4930 – 5950 (5640) long. Nerve ring 790 – 870 (835), deirids 870 – 970 (925). S – E pore 935–1225 (1065) from anterior end. Tail 970 – 1190 (1090) long ending in pointed tip; vulva immediately anterior to anus, 2175 – 2550 (2290) from posterior end. Vagina short, straight, 300 – 470 (410) long; vestibule muscular, about same length as sphincters, infundibula shorter. Eggs ellipsoidal 119 – 122 (120) x 66 – 69 (68.5).

Fourth stage larva (n = 3)

Length 5–8 mm, width 270–660. Oesophagus 1700–2295 long. S – E pore 335–670 from anterior end. Fleshy collar not developed at cephalic end, 6 peri-oral, lip-like processes present. Anterior end of intestine developing into diverticula. Tail 235 – 250 long.

Etymology

The specific name *simile* refers to the similarities between this new species and *Dorcopsinema dorcopsis*, also occurring in forest wallabies.

Remarks

Dorcopsinema simile sp. nov. is very similar to *D. dorcopsis* particularly in having eight peri-oral lip-like processes around the mouth, a fleshy cephalic collar and in the length of the oesophagus and spicules. *Dorcopsinema simile* differs in the relative positions of the nerve ring and deirids, the nerve ring being more anterior than in *D. dorcopsis* (583–

737 compared with 737–985). This results in the deirids being posterior to the nerve ring rather than anterior to it as in *D. dorcopsis*. Other differences between the two species are that the eggs of *D. simile* are larger (120 x 68.5) than those of *D. dorcopsis* (115 x 57.5), *D. simile* females have shorter tails (970–1190 compared with 1120–1430) and shorter vaginae (300–470 compared with 680) than *D. dorcopsis*. *Dorcopsinema simile* has three pairs of appendages on the posterior lip of the genital cone and the lateral branchlets of the dorsal ray arise slightly anterior to its bifurcation from the dorsal trunk whereas *D. dorcopsis* has four pairs of appendages on the posterior lip of the genital cone and the lateral branchlets of the dorsal ray arise slightly posterior to its bifurcation from the dorsal trunk. Although these morphological differences may seem slight they are consistent and are sufficient to differentiate *D. dorcopsis* from *D. simile*. Within the Labiostrongylinea the significance of such minor morphological differences between species has been confirmed by enzyme electrophoresis (Chilton & Smales 1996; Smales & Chilton 1997). Furthermore, species pairs, readily distinguished by the relative positions of deirids and nerve ring have been differentiated by Chilton *et al.* (1993) and Beveridge (1998) for other elaeocinid species.

Dorcopsinema simile occurs in *Dorcopsilus vanheurni* whereas *D. dorcopsis* occurs in *Dorcopsilus muelleri* (Schlegel, 1866) and *Dorcopsilus luemosus* (D'Albertis, 1874) (see Smales 1997).

Key to the species of *Dorcopsinema*

revised from Smales 1997

1. With fleshy head collar bearing amphids and cervical papillae; eight sclerotised lip-like processes; spicules > 1650 μ m long. Parasites of *Dorcopsilus* 2
With or without clearly defined fleshy head collar; six sclerotised lip-like processes. Parasites of *Dendrolagus* 3
2. With deirids posterior to nerve ring; lateral branchlets arising anterior to the bifurcation of the dorsal ray; vagina < 480 μ m long *D. simile*
With deirids anterior to nerve ring; lateral branchlets arising posterior to the bifurcation of the dorsal ray; vagina > 600 μ m long *D. dorcopsis*
3. With clearly defined head collar; deirids near collar; spicules < 1275 μ m long; female tail without spike *D. mbaiso*
Without clearly defined head collar; deirids close to nerve-ring; spicules > 1300 μ m long; female tail with spike *D. dendrolagi*

Discussion

Although small, the sample of four individuals surveyed in this study is indicative of the diversity of nematode species occurring in most kangaroos and wallabies (Spratt *et al.* 1991). Representatives of all the tribes, except the Zoniolaiminea (Popova, 1952), of the Cloacinae (Beveridge 1987) have been found. *Paralabiostrongylus bicollaris* and *Ds. labiacarinatus* are exclusive to the island of New Guinea, occurring also in *Do. hageni* Heller, 1897 and *Do. luctuosa* (Smales 1982b; Spratt *et al.* 1991). As discussed by Smales (1997), hosts collected in Papua New Guinea and identified as *Dorcopsis veleram* Lesson, 1872 (syn. *D. muelleri*), by Smales (1982a) and Spratt *et al.* (1991) are now known to be *Do. luctuosa* (Flannery 1995). *Coronostromylus coronatus* has been previously reported from the forest wallabies *Do. hageni* and *Do. luctuosa* and is also found in several macropodid genera in Australia (Spratt *et al.* 1991). Similarly, *Macropostrongylus* species occur in both Australian and Papua New Guinea hosts (Mawson 1977; Beveridge 1985).

Dorcopsinema occurs only in hosts on the island of New Guinea. It has not been found in the Australian species of tree kangaroos (Spratt *et al.* 1991). Australian tree kangaroos studied to date have a depauperate helminth community as compared with other macropodid species. Seven *De. lamholtzi* Collett, 1884 from Queensland examined for parasites (Beveridge *et al.* 1992) had only two species, *Labiostrongylus dendrolagi* Smales, 1995 and *Zoniolaimis dendrolagi* Beveridge, 1983, present in the stomach. Hosts from the island of New Guinea, however, have a more diverse stomach fauna, including *Cloacina* spp., *L. redmondii* Smales, 1982, *Macropostrongyloides dendrolagi* Beveridge, 1997, *Mhaisonema cornutum* Beveridge, 1997, *Z. niuginiensis* Beveridge, 1983, *Pharyngostrongylus dendrolagi* Beveridge, 1982, *Dorcopsinema* spp. and *Popovastrongylus* sp. (see Flannery *et al.* 1996; Beveridge 1997).

Tree kangaroos have evolved into a group of arboreally adapted species unique to New Guinea (Flannery 1995). The most primitive group, however, includes the two species *De. bonnetianus*

De Vis, 1887 and *De. lamholtzi* which are found only in Australia (Flannery 1995). Ancestors of these Australian species are thought to have migrated south across Torres Strait and now represent a remnant of New Guinean fauna left on Cape Yorke Peninsula (Johnson 1995; Martin & Johnson 1995). The forest wallabies *Dorcopsulus* and *Dorcopsis* are now exclusive to New Guinea. Ancestral Australian tree kangaroos may have lost components of their helminth communities during migration south to Cape Yorke Peninsula or following isolation from the northern populations of tree kangaroos on the island of New Guinea. Alternatively New Guinean tree kangaroos may have acquired a richer helminth fauna through host switching from the indigenous forest wallabies, after the isolation of New Guinea from the Australian continent.

Fourth stage larvae of *D. simile* examined in this study had three pairs of lip-like processes not four as found in the adults. This suggests that three pairs of lip-like processes may be a primitive condition and four pairs of lip-like processes an advanced character. If three pairs of lip-like processes is the primitive condition then the species occurring in forest wallabies have the derived condition, *Dorcopsinema dorcopsis*, the other species of *Dorcopsinema* occurring in forest wallabies, also has four pairs of lip-like processes but *D. mhaiso* and *D. dendrolagi*, occurring in tree kangaroos have only three pairs. Forest wallabies, however, are primitive browsing species while tree kangaroos are evolved arboreal species (Flannery 1989). By contrast, trends towards simplicity of male characters from *D. dorcopsis* to *D. mhaiso* were noted by Smales (1997) suggesting a period of co-evolution of *Dorcopsinema* and tree kangaroos. The helminth data from both groups of macropodid hosts are fragmentary and additional surveys of their helminth populations are needed before the existence of any patterns can be determined.

Acknowledgments

My thanks to I. Beveridge who made the material available and to E. Harris, Natural History Museum, London and J. Forrest, South Australian Museum, Adelaide who gave me access to museum specimens.

References

- BAYLIS, H. A. (1940) A new species of the nematode genus *Macropostrongylus*. *Ann. Mag. Nat. Hist. Ser.* 11, 6, 313-318.
- BEVERIDGE, I. (1985) *Macropostrongylus* Yorke & Maplestone, 1926 (Nematoda, Strongyloidea) from macropodid marsupials. *Bull. Mus. nat. Hist. nat. Paris 4e sér.* 7, 761-780.
- (1987) The systematic status of Australian Strongyloidea (Nematoda). *Und. 4e sér.* 9, 107-126.
- (1997) *Macropostrongyloides dendrolagi* n. sp. and *Mhaisonema coronatum* n. g., n. sp. two new species of nematodes (Strongyloidea: Cloacinae) from tree kangaroos, *Dendrolagus* spp. (Marsupialia: Macropodidae) from Irian Jaya, Indonesia. *Syst. Parasitol.* 38, 25-31.
- (1998) Taxonomic revision of the genus *Cloacina* von Linstow (Nematoda: Strongyloidea) from macropodid marsupials. *Invert. Taxon.* 12, 1-273.

- _____, SPEARE, R., JOHNSON, P. M. & SPRATT, D. M. (1992) Helminth parasite communities of macropodid marsupials of the genera *Hypsiprymnodon*, *Aepyprymnus*, *Thylogale*, *Onychogalea*, *Lagorchestes* and *Dendrolagus* from Queensland. *Wild. Res.* **19**, 359-376.
- CHILTON, N. B., BEVERIDGE, I. & ANDREWS, R. H. (1993) Electrophoretic comparison of *Rugopharynx longibursaris* Kung and *R. omega* Beveridge (Nematoda: Strongyloidea), with the description of *R. sigma* n. sp. from pademelons, *Thylogale* spp. (Marsupialia: Macropodidae). *Syst. Parasitol.* **26**, 159-169.
- _____, & SMALES, L. R. (1996) An electrophoretic and morphological analysis of *Labiostrongylus (Labiostrongylus) uncinatus* (Nematoda: Cloacinae), with the description of a new species *L. contiguus*, from *Macropus parryi* (Marsupialia: Macropodidae). *Ibid.* **35**, 49-57.
- FLANNERY, T. F. (1989) Phylogeny of the Macropodoidea: a study in convergence pp. 1-46 *In* Grigg, G., Jarman, P. & Hume, I. (Eds) "Kangaroos, wallabies and rat-kangaroos" (Surrey Beatty & Sons, Chipping Norton).
- _____, (1995) "Mammals of New Guinea" (Reed Books, Chatswood).
- _____, MARTIN, R. & SZALAY, A. (1996) "Tree kangaroos : a curious natural history" (Reed Books, Melbourne).
- JOHNSON, P. M. (1995) Lumholtz's tree-kangaroo *Dendrolagus lumholtzi* Collett, 1884 pp. 309-310 *In* Strahan, R. (Ed.) "The mammals of Australia" (Reed Books, Chatswood).
- MARTIN, R. W. & JOHNSON, P. M. (1995) Bennett's tree-kangaroo *Dendrolagus bennettianus* De Vis, 1887 pp. 307-308 *Ibid.*
- MAWSON, P. M. (1977) Revision of the genus *Macropostrongylus* and description of three new genera: *Popovastromylus*, *Dorcopsinema* and *Arundelia*. *Trans. R. Soc. S. Aust.* **101**, 51-62.
- SMALES, L. R. (1982a) A new genus and three new species of nematode parasites (Strongyloidea: Cloacinae) from macropodid marsupials from Papua New Guinea. *Syst. Parasitol.* **4**, 361-371.
- _____, (1982b) *Dorcopsistrongylus* new genus (Nematoda: Strongyloidea) from the grey scrub wallaby *Dorcopsis veterum* Lesson, 1827 from Papua New Guinea. *Trans. R. Soc. S. Aust.* **106**, 31-34.
- _____, (1997) A new species of *Dorcopsinema* Mawson, 1977 (Nematoda: Cloacinae) from the tree kangaroo *Dendrolagus mbaiso* (Marsupialia: Macropodidae) from Irian Jaya, Indonesia and new host records for *Dorcopsinema dendrolagi*. *Syst. Parasitol.* **38**, 131-135.
- _____, & CHILTON, N. B. (1997) An electrophoretic and morphological analysis of *Labiostrongylus (Labiosimplex) bancrofti* (Johnston & Mawson, 1939) (Nematoda: Cloacinae), from macropodid marsupials. *Ibid.* **36**, 193-201.
- SPRATT, D. M., BEVERIDGE, I. & WALTER, E. L. (1991) A catalogue of Australasian monotremes and marsupials and their recorded helminth parasites. *Rec. S. Aust. Mus. Monogr. Ser. No. 1*, 1-150.